



MAGNE-HEAD



MAGNETIC DRUM MEMORY SYSTEMS

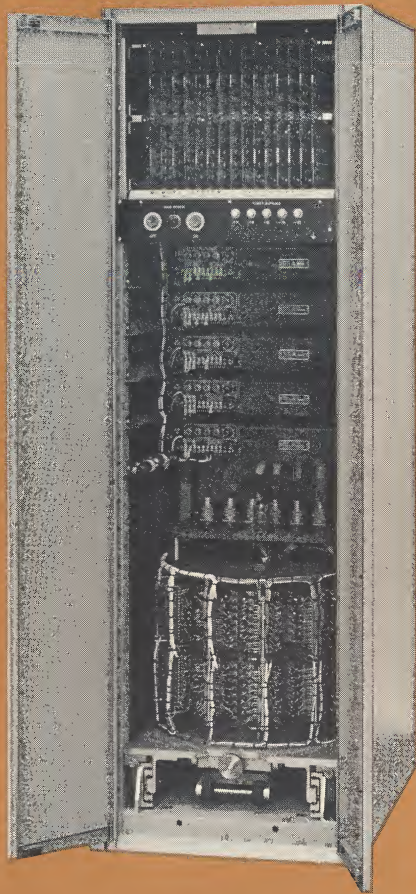
Magne-Head engineers and technicians form a team with the proven capability to design Magnetic Drum Memory Systems which meet the most exacting requirements.

Every Magne-Head project benefits from experience in engineering and producing sophisticated drum memory systems. Accomplishments include memories for military command and control networks, tactical displays, and computer-based communications multiplexing.

Teamwork does it. A single engineering group is responsible for the complete system. The three major system components—heads, drums, and circuits—are designed and manufactured at Magne-Head by specialists in each component area.

Component integration can be costly and time consuming if a memory system is purchased piecemeal. Matching heads to drums and both to circuitry are exacting specialties, *Magne-Head specialties*. Production hardware at Magne-Head is "state of the art" elsewhere. Put these accomplishments and the benefits of single-source responsibility for all components to work for you.

Check your requirements for your complete Magnetic Drum Memory System with Magne-Head.

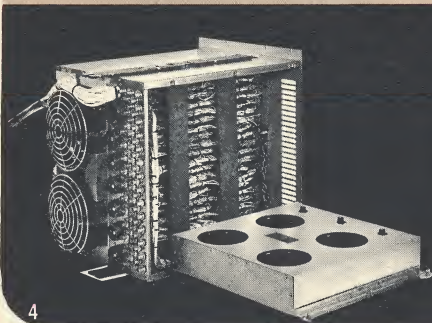
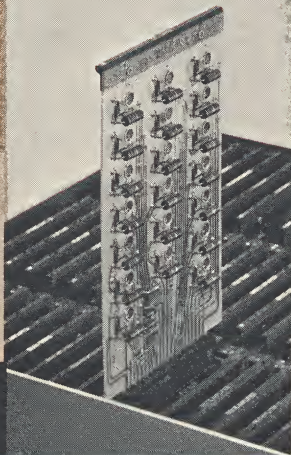


1

1. Typical memory system for computers, data processors, and communications switching systems.
2. Drum Tester.
3. Logic Boards.
4. Military Memory System.



2



4

GENERAL INSTRUMENT CORPORATION...
RESEARCH AND MANUFACTURING FACILITIES
LOCATED THROUGHOUT THE UNITED STATES

Beckley
West Virginia
Brooklyn
New York
Chicopee
Massachusetts
Darlington
South Carolina

Garden City
New York
Hawthorne
California
Hicksville
New York (2)
Joliet
Illinois

Mt. Forest
Ontario, Canada
Newark
New Jersey
Tazewell
Virginia
Waterloo
Ontario, Canada

Westbury
New York
Westwood
Massachusetts
Woodbury
Connecticut
Woonsocket
Rhode Island



MAGNE-HEAD, A DIVISION OF
GENERAL INSTRUMENT CORPORATION

MAGNETIC MEMORY DRUMS

All magnetic memory drums designed and manufactured by Magne-Head are made of special magnesium alloy, chosen for its strength, light weight and dimensional stability through temperature cycling and aging.

The rotating member is a properly proportioned cylinder with end plates mounted on tapered conical fits. The shaft and end plates are fitted together with slotted cones. There are no press or shrink fits in a Magne-Head drum.

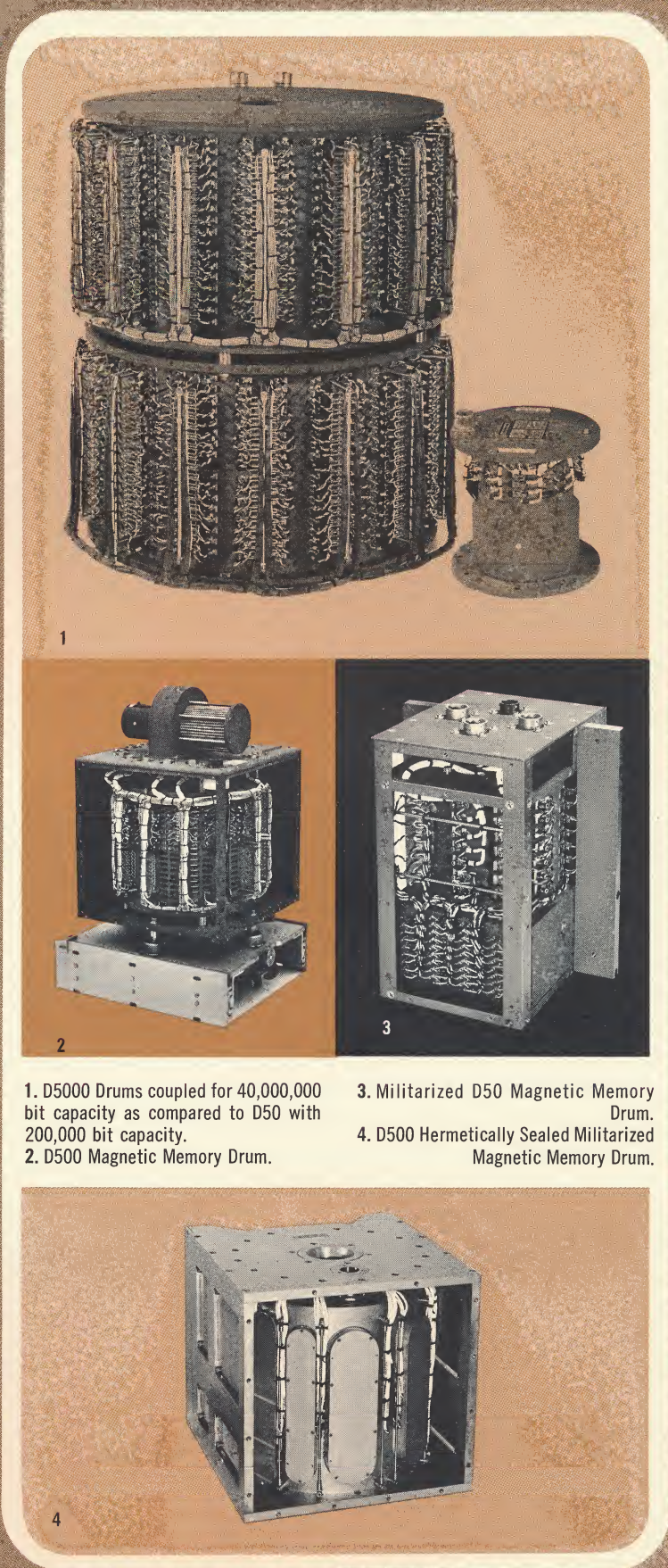
The magnetic medium is hard nickel-cobalt plate which eliminates catastrophic failures due to foreign matter coming in contact with the rotating member, and the dusting and flaking problems inherent with iron oxide coatings.

The shroud assembly is an ultra precision machined portion of the drum with close tolerances which make possible a simple head placement and maintenance procedure.

A motor is custom designed for each application and is shaped to fit inside the drum proper, resulting in very efficient use of space.

The Magne-Head drum uses a double squirrel cage rotor in every induction motor. A low reluctance portion of the rotor gives excellent start characteristics; a high reluctance portion contributes to low slip, high efficiency run characteristics.

The light weight magnesium drum, coupled with air floating record-play-back heads and metal magnetic coatings make up the most efficient drum package available. This package is almost impervious to temperature shocks, environmental extremes, aging, technician's error, shipping hazards, and the myriad of other problems, inherent with less advanced designs.



1. D5000 Drums coupled for 40,000,000 bit capacity as compared to D50 with 200,000 bit capacity.
2. D500 Magnetic Memory Drum.

3. Militarized D50 Magnetic Memory Drum.
4. D500 Hermetically Sealed Militarized Magnetic Memory Drum.

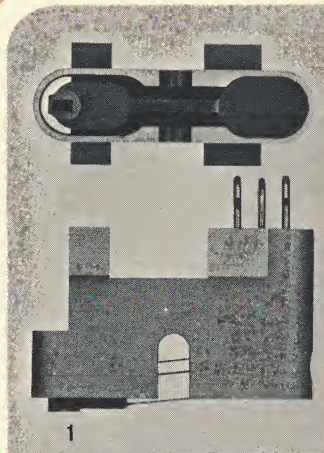
AIR FLOATING DRUM HEADS

Magne-Head manufactures a complete line of air floating record-playback heads. Conservative design, tight manufacturing tolerances, and close surveillance of manufacturing eliminate complicated installation and adjustment procedures. The addition or replacement of heads without stopping the drum cuts installation and adjustment time to a fraction of that required for conventional, non-floating heads. The proximity of the air floating head to the magnetic medium greatly improves record-read efficiency. Record currents are reduced typically by a factor of two. Playback signal is at least tripled over non-floating heads of equivalent inductance and track width. The resulting lower inductance, required for a given application, allows more rapid data transfer into and out of the drum.

MAGNETIC HEADS

Magne-Head is an industry leader in the design and manufacture of magnetic heads for all areas of commercial and military application. Continuing research enables Magne-Head to offer improvements in both performance standards and packaging design. Heads for special purposes, such as magnetic ink character recognition, ledger stripe reading and multiple track magnetic card reading are used in production by many leading equipment manufacturers. Industry standard tape heads are available in the IBM and IRIG track formats for read after write and interlace recording.

Look to Magne-Head. Our engineering people are available to work with you on any magnetic head problem—large or small—from prototype to production.



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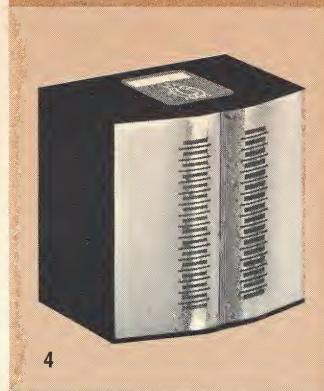


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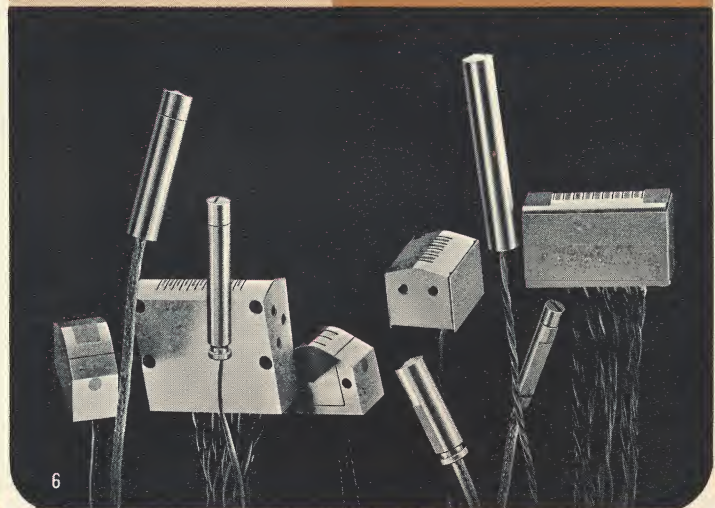
1. MHD-1 Single track airfloating digital drum head.
2. DHW-56 56-track read after write digital head—3" tape.
3. TB-10 10-track read/write analog head— $\frac{1}{2}$ " tape.
4. DEW-16 16-track read after write digital head—1" tape.
5. DBW-7 7-track read after write digital head— $\frac{1}{2}$ " tape.
6. Head group illustrating form factor flexibility.



4



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6

MAGNE-HEAD, A DIVISION OF GENERAL INSTRUMENT CORPORATION

Magne-Head is a division of General Instrument Corporation, one of America's largest and most successful electronic companies. As do all divisions of General Instrument, Magne-Head operates autonomously, with the stability and maturity of management characteristic of large corporations. Each division is free to draw on each of the others for their particular specialties. This gives each division a broad platform of capability. The financial strength of General Instrument assures that Magne-Head will be here to finish long term projects.

Activities at Magne-Head cover the whole range of manufacturing from prototype to production. Magne-Head designs and manufactures tape heads, magnetic memory drums and magnetic memory drum systems for aerospace, military and industrial applications. Many of the nation's critical and high priority military and space programs rely on Magne-Head products for both in-flight and ground support applications.

Quality Control at Magne-Head is an independent group reporting directly to Division management.

Military and commercial customer survey teams have approved Magne-Head production and inspection facilities. Plant, people, and procedures meet the exacting standards of major prime military contractors including the Martin Company, General Electric Company, Bunker-Ramo Corp., Nortronics Division of Northrop Corporation, the Lockheed Missiles and Space Company, and International Telephone and Telegraph Corp. Magne-Head is serviced by quality control representatives of both the United States Air Force and Army Ordnance.

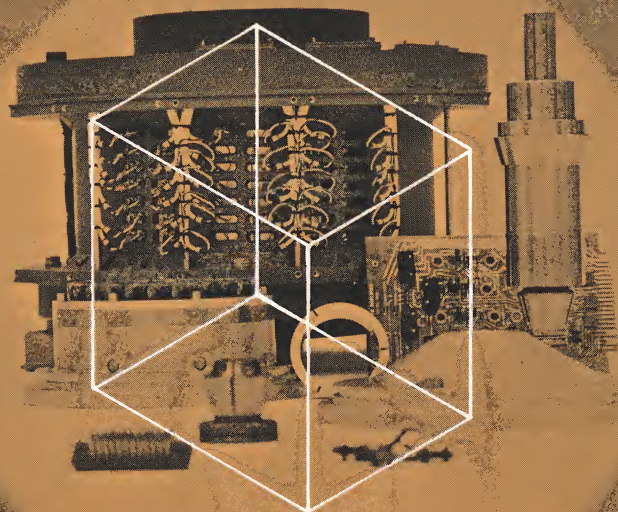
Factory Sales and Application Engineering staffs are available for on-the-spot consultations in the customer's plant. A strong network of representatives is maintained throughout the United States to provide fast, convenient customer service.

Design and production facilities are located in Hawthorne, California, the heart of the aerospace complex near Los Angeles International Airport, and provide convenient customer liaison and the fastest possible delivery of hardware to both the domestic and foreign markets.



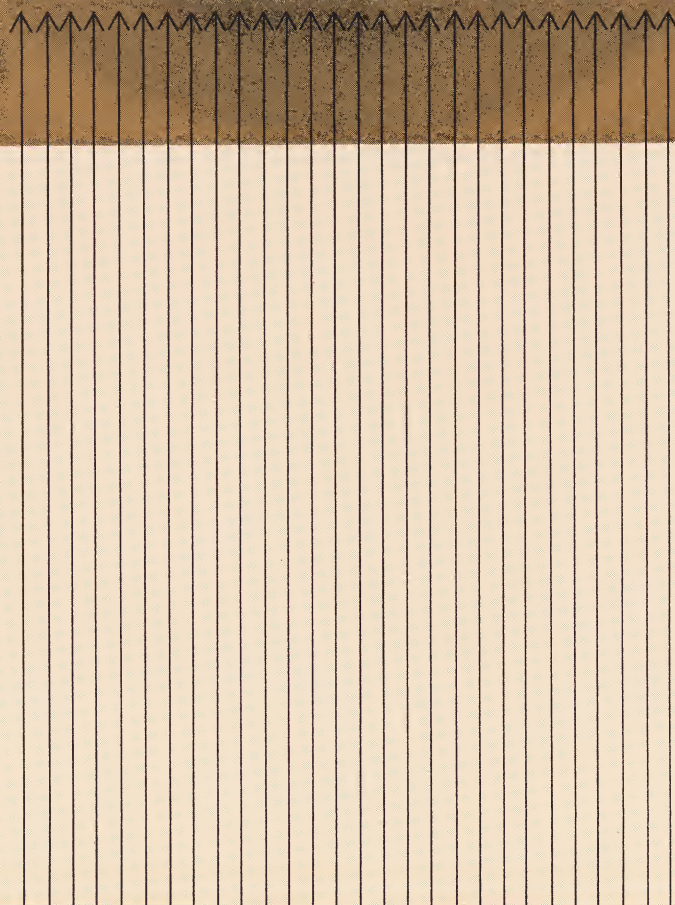
MAGNE-HEAD *a division of General Instrument Corp.*

13040 South Cerise Avenue * Hawthorne, California 90250 * 213 679-3377/772-2351 * TWX910-325-6203



MAGNE-HEAD

DRUM MEMORY SYSTEMS



TRANSIENT ERROR RATE

<1 BIT IN 10^{12} BITS

SINGLE BIT ALTERATION PHASE MODULATION RECORDING

<3 MICROSECONDS

WRITE TO READ RECOVERY

These are standard features — not extra - cost “options”
— of Magne-Head magnetic drum memory systems.

LOW ERROR RATE

Reliability is of prime importance in any system. Magne-Head systems must test to a transient error rate of less than one bit in 10^{12} bits. This error rate is achieved with $\pm 5\%$ power supply deviation and with worst case bit patterns applied to 100% of the drum surface.

FLEXIBLE RECORDING TECHNIQUES

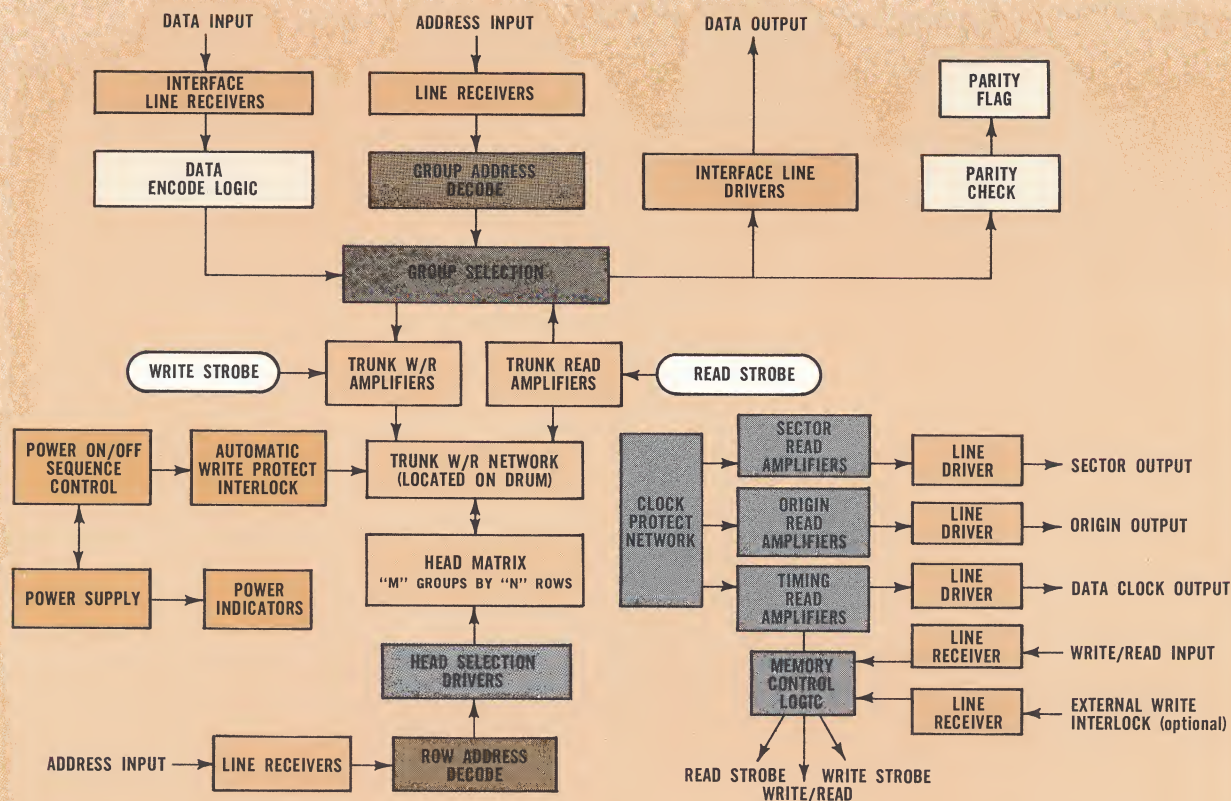
Single bit alteration coupled with phase modulation recording permits reliable operation at high bit transfer rates and packing densities. Development of this technique makes it practical, for example, to record an 8-bit character in parallel at 1 megacycle, packed 600 characters per inch.

FAST RESPONSE

Less than 3 microseconds write-to-read recovery cuts average system access time. With look-ahead programming, it's now possible to read time-adjacent information blocks without waiting for a full drum revolution.

Magne-Head Systems include the interface logic necessary for data exchange between the memory and the data source. Circuit elements accept any digitally coded data and return it on command to its source. This interface versatility minimizes the number of lines necessary to communicate with the memory. For example, less than 30 lines are required to access 16,000,000 bits of information. Standard recording and play-back methods may be implemented with one read-write amplifier design. All magnetic drums in the Magne-Head line — D50, D500, D5000 — are compatible with this design. “Class A Commercial” is the minimum manufacturing standard at Magne-Head. Magne-Head Systems may also be specified to meet the requirements of MIL-E-4158B and MIL-E-4970A. High manufacturing standards pay off in low-cost maintenance, increased system life and years of trouble-free operation. Look to Magne-Head for drum memories. Consult the data; note the wide range of application of Magne-Head systems. Our engineering people look forward to working with you on any system problem: 50 kilocycles to 1 megacycle; 50 kilobits to 100 megabits.





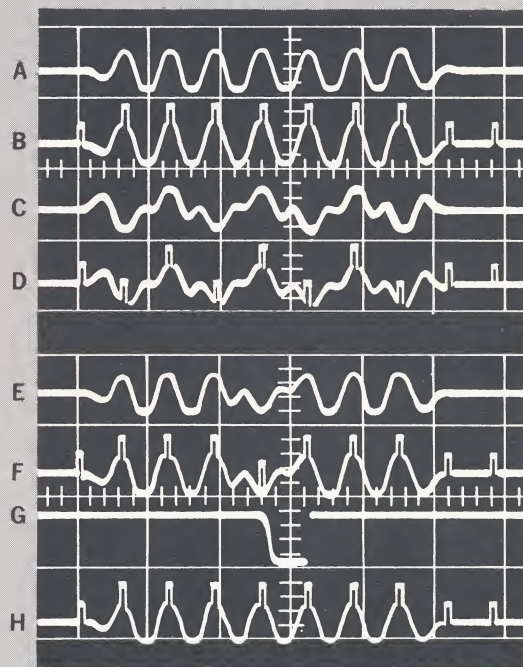
SINGLE BIT ALTERATION AT 500 BITS PER INCH USING PHASE MODULATION RECORDING

1. The following demonstrates Magne-Head's capability in single bit alteration using Phase Modulation recordings at moderately high packing densities. The example used illustrates 500 bits per inch. The photograph shows that 500 bits per inch is not the limit of the head or coating. This is evident because there is no adjacent pulse shift or attenuation when a bit is removed or inserted. Wave forms were photographed at the output of a standard Magne-Head read amplifier.

2. Oscilloscope Calibration
Sweep 2.0 microseconds/cm
Sensitivity 20.0 volts/cm

3. Drum Specifications
Speed 3600 RPM
Diameter 8 inches
Bits/track 12,560
Bit Packing Density 500 per inch
Flux Reversals 1000 per inch
Clock Frequency Read 743 KC
Clock Frequency Record 1.486 MC

Trace A One (1) in each cell.
Trace B Read strobe superimposed.
Trace C One (1) - Zero (0) pattern.
Trace D Read strobe superimposed.
Trace E Fourth cell modified to a zero (0).
Trace F Read strobe superimposed.
Trace G Read amp D.C. restored output.
Trace H Fourth cell modified to a one (1).



SYSTEMS DATA

Total Storage	50K to 100 million bits
Data Transfer Rate Bit Serial or Bit Parallel	to 1 megacycle
Data Input Requirements	0V and -5 to 20V or 0V and +5 to or +20V
Address and Control Line Input Requirements	0V and -5 to -20V or 0V and or +5 to +20V
Data Input Format	Bit serial, parallel, serial - parallel.
Data Editing	Single bit, single character, block, bit or character interlace.
Clock Output	0V and -5 to -12V
Data Output	or 0V and +5 to +12V
Primary Power Input Any one of the following	120V single phase 60 cps 120/208V 3 phase 60 cps 120V single phase 400 cps 120/208V 3 phase 400 cps
Write to Read Recovery	3 microseconds maximum in an 8 x 64 matrix.
Read to Read and Read to Write Recovery	500 nanoseconds maximum in an 8 x 64 matrix.
Error Rate	<1 in 10^{12} bits
Access Time	4 to 35 milliseconds average.
Clock protect	to 100V DC
Optional Functions	Memory busy Flag, Parity flag Non destructive power loss. Any frequency primary power.



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D5000

BULK STORAGE MAGNETIC MEMORY DRUM

FEATURES:

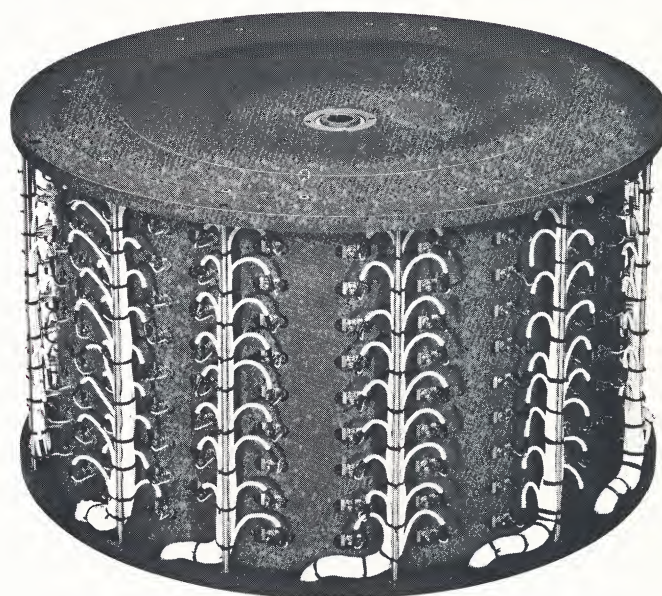
● **DEPENDABILITY:** *Plated metal magnetic coating provides the optimum recording surface—hard and durable.*

● **CONVENIENCE:** *Record-play heads may be inserted while the drum is running, with no radial adjustment.*

● **CAPACITY:** *Bit packing densities to 2000 per inch NRZ (1000 per inch phase modulation, R.B., or R.Z.)*

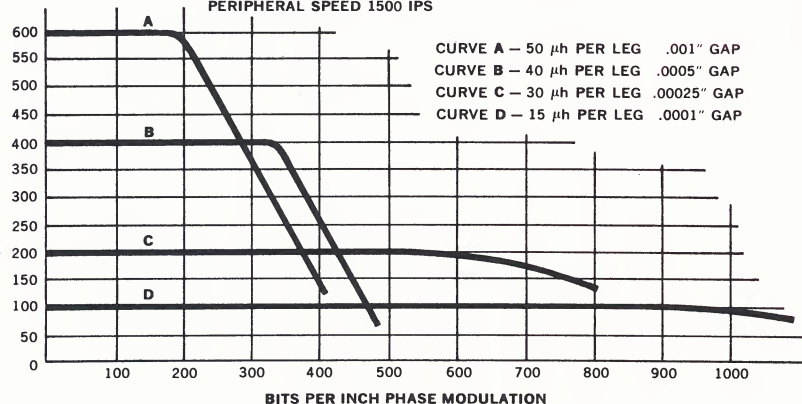
● **SIGNAL TO NOISE RATIO:** *26 db.*

● **VERSATILITY:** *Compliance with applicable military specifications—ground, shipboard, airborne.*



Typical section of D5000 Series drum—18" diameter, 1800 RPM. 20,000,000 bit capacity per section, 4 sections can be stacked to expand total bulk storage memory to as many as 80,000,000 bits.

TYPICAL OUTPUT IN M.V. PEAK TO PEAK (1500 OHM LOAD) AIR FLOATING HEAD
PERIPHERAL SPEED 1500 IPS



A PLAYBACK SIGNAL VERSUS PACKING DENSITY GRAPH shows output signal levels over a wide range of frequencies. (Frequency equals peripheral speed in inches per second times packing density in bits per inch phase modulation.) Curves illustrated reflect a peripheral speed of 1500 inches per second. Different speeds produce a roughly linear change in signal level. Outputs shown on the graph are conservatively de-rated. Production experience exceeds these ratings by approximately 25%.

D5000 MODULAR DRUM

The D5000 Bulk Storage Magnetic Memory Drum employs a new technique of modular section construction which permits the stacking of sections to expand bulk storage capacity. Each modular section has a total memory capacity of 20,000,000 bits and four sections can be stacked to expand total bulk storage memory to as many as 80,000,000 bits. Each individual section incorporates all of the design features of Magne-Head's D50 and D500 Series of Magnetic Memory Drums.

The modular section drum is ideal for computers designed for bulk storage memory and whose total memory varies as a function of application such as in Process Control and Inventory Control. In applications of this nature, where total bulk storage capacity is an unknown or varying factor, the modular section technique of stacking eliminates the necessity of specifying a special drum for each size of memory and the need for anticipating the optimum memory requirement of the application.

To the systems designer, all of this means fewer interface restrictions when integrating the memory subsystem into the total system.

Magne-Head drums meet a broad range of operational requirements because of flexible design within a framework of dependability. Features and design parameters tailored to meet individual application needs include drum size, speed, and motor type...record-play head inductance, head layout, and wiring harness arrangements.

For military systems, D5000 Series drums are designed to meet these typical specifications:

Ground Based:	MIL-E-4970A and MIL-E-4158B
Shipboard:	MIL-E-16400E
Airborne:	MIL-E-5400

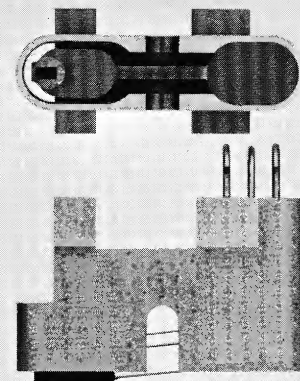
D 5 0 0 0 D E S I G N D A T A

DIAMETER:	18" per section
LENGTH:	12" per section
MAXIMUM NO. OF SECTIONS:	4
ECCENTRICITY:	Less than .000050 inches
BEARINGS:	Class 9; factory sealed and lubricated
MOTOR:	Custom designed integral motor, induction or synchronous
ROTATION SPEED:	900, 1800, 3600 RPM
TRACKS PER INCH:	40 nominal
TOTAL STORAGE CAPACITY:	20,000,000 bits per section
MAXIMUM CLOCK RATE:	2 megacycles
MAGNETIC MEDIUM:	Hard nickel-cobalt plate. By becoming an integral part of the rotating member, the plated surface eliminates dusting and flaking problems inherent with iron oxide coatings. Extreme surface hardness greatly reduces susceptibility to catastrophic failure should foreign matter come in contact with the rotating member.

RECORD-PLAY HEADS

The unique aerodynamic head developed by Magne-Head cuts installation and adjustment time to a fraction of that required for conventional, non-contact heads. To add or replace a head, simply insert it at the desired location and lock it in place, *all without stopping the drum*. Head and head slot design make it virtually impossible to damage either the head or the drum coating during the installation process.

Electrical specifications such as head inductance and drive current requirements may be varied to suit the application.

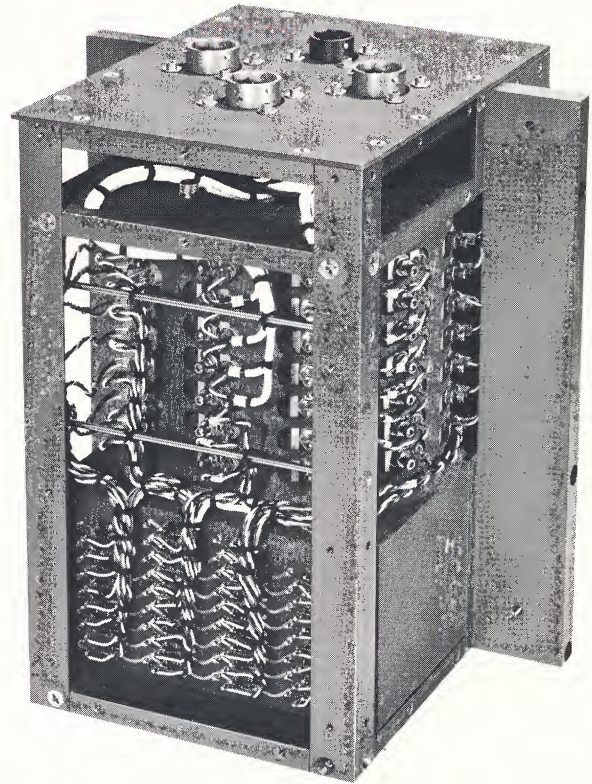




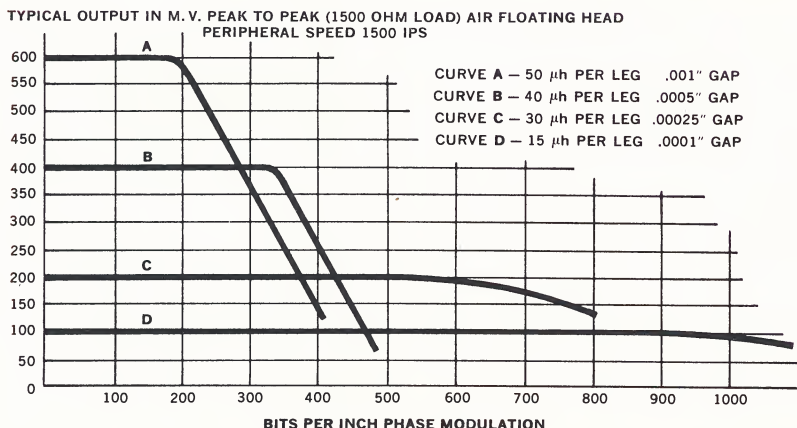
D50 SERIES AIRBORNE MAGNETIC MEMORY DRUMS

FEATURES:

- **DEPENDABILITY:** *Plated metal magnetic coating provides the optimum recording surface—hard and durable.*
- **CONVENIENCE:** *Record-play heads may be inserted while the drum is running, with no radial adjustment.*
- **CAPACITY:** *Bit packing densities to 2000 per inch NRZ (1000 per inch phase modulation, R.B., or R.Z.)*
- **SIGNAL TO NOISE RATIO:** *26 db.*
- **VERSATILITY:** *Compliance with applicable military specifications—ground, shipboard, airborne.*



Typical D50 Series drum—4" diameter, 3600 RPM.
Other diameters available in the
D50 Series from 3" to 6".



A PLAYBACK SIGNAL VERSUS PACKING DENSITY GRAPH shows output signal levels over a wide range of frequencies. (Frequency equals peripheral speed in inches per second times packing density in bits per inch phase modulation.) Curves illustrated reflect a peripheral speed of 1500 inches per second. Different speeds produce a roughly linear change in signal level. Outputs shown on the graph are conservatively de-rated. Production experience exceeds these ratings by approximately 25%.

D50 DRUM

All drums in the small to medium size D50 Series share basic design features. Magne-Head design criteria provide superior performance: more bits per square inch of recording surface, higher output signal levels, and long term maintenance-free operation. To the systems designer, all of this means fewer interface restrictions when integrating the memory subsystem into the total system.

Magne-Head drums meet a broad range of operational requirements because of flexible design within a framework of dependability. Features and design parameters tailored to meet individual application needs include drum size, speed, and motor type...record-play head inductance, head layout, and wiring harness arrangements.

For military systems, D50 Series drums are designed to meet these typical specifications:

Ground Based: MIL-E-4970A and
MIL-E-4158B
Shipboard: MIL-E-16400E
Airborne: MIL-E-5400

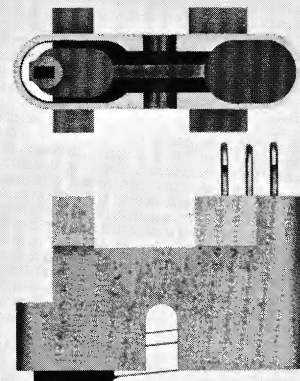
D50 DESIGN DATA

DIAMETER:	3 to 6 inches
LENGTH:	1 to 10 inches
ECCENTRICITY:	Less than .000050 inches
BEARINGS:	Class 9; factory sealed and lubricated
MOTOR:	Custom designed integral motor, induction or synchronous
ROTATION SPEED:	Speed limits are set by rotating member diameter. Maximum speed for D50 Series drums is 24,000 RPM, at a diameter of 3 inches.
TRACKS PER INCH:	40 nominal
TOTAL STORAGE CAPACITY:	Approximate storage capacity ranges between these limits, according to drum size: 3" diameter x 1" length—270,000 bits phase modulation 6" diameter x 9" length—5,400,000 bits phase modulation
MAXIMUM CLOCK RATE:	2 megacycles
MAGNETIC MEDIUM:	Hard nickel-cobalt plate. By becoming an integral part of the rotating member, the plated surface eliminates dusting and flaking problems inherent with iron oxide coatings. Extreme surface hardness greatly reduces susceptibility to catastrophic failure should foreign matter come in contact with the rotating member.

RECORD-PLAY HEADS

The unique aerodynamic head developed by Magne-Head cuts installation and adjustment time to a fraction of that required for conventional, non-contact heads. To add or replace a head, simply insert it at the desired location and lock it in place, *all without stopping the drum*. Head and head slot design make it virtually impossible to damage either the head or the drum coating during the installation process.

Electrical specifications such as head inductance and drive current requirements may be varied to suit the application.





D50 SERIES AIRBORNE MAGNETIC MEMORY DRUMS

FEATURES:

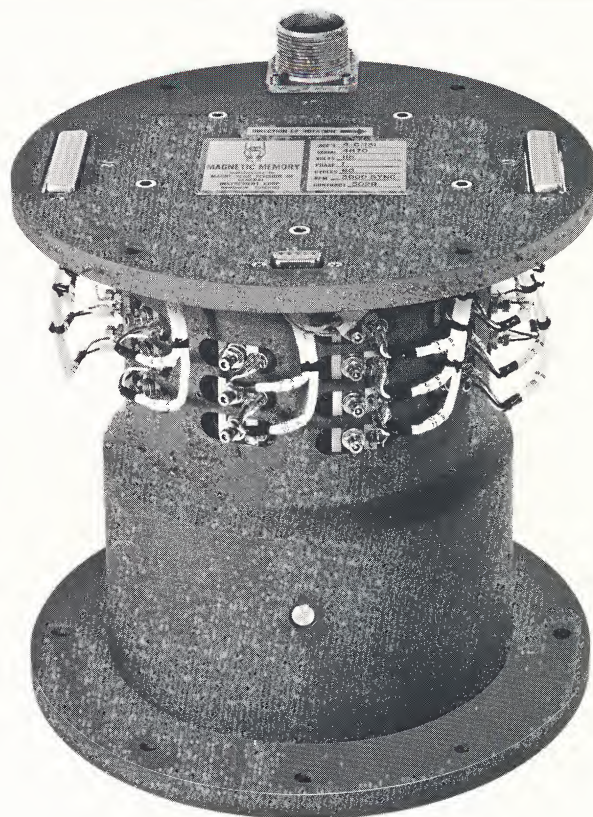
● **DEPENDABILITY:** *Plated metal magnetic coating provides the optimum recording surface—hard and durable.*

● **CONVENIENCE:** *Record-play heads may be inserted while the drum is running, with no radial adjustment.*

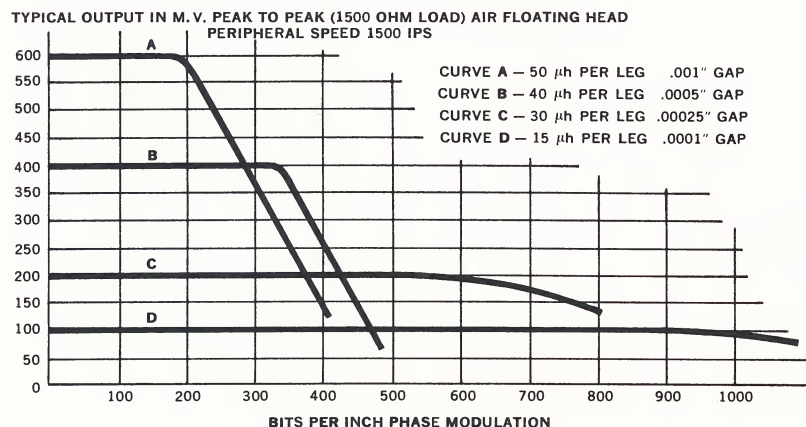
● **CAPACITY:** *Bit packing densities to 2000 per inch NRZ (1000 per inch phase modulation, R.B., or R.Z.)*

● **SIGNAL TO NOISE RATIO:** *26 db.*

● **VERSATILITY:** *Compliance with applicable military specifications—ground, shipboard, airborne.*



Typical D50 Series drum—4" diameter, 3600 RPM.
Other diameters available in the
D50 Series from 3" to 6".



A PLAYBACK SIGNAL VERSUS PACKING DENSITY GRAPH shows output signal levels over a wide range of frequencies. (Frequency equals peripheral speed in inches per second times packing density in bits per inch phase modulation.) Curves illustrated reflect a peripheral speed of 1500 inches per second. Different speeds produce a roughly linear change in signal level. Outputs shown on the graph are conservatively de-rated. Production experience exceeds these ratings by approximately 25%.

D50 DRUM

All drums in the small to medium size D50 Series share basic design features. Magne-Head design criteria provide superior performance: more bits per square inch of recording surface, higher output signal levels, and long term maintenance-free operation. To the systems designer, all of this means fewer interface restrictions when integrating the memory subsystem into the total system.

Magne-Head drums meet a broad range of operational requirements because of flexible design within a framework of dependability. Features and design parameters tailored to meet individual application needs include drum size, speed, and motor type...record-play head inductance, head layout, and wiring harness arrangements.

For military systems, D50 Series drums are designed to meet these typical specifications:

Ground Based: MIL-E-4970A and
MIL-E-4158B
Shipboard: MIL-E-16400E
Airborne: MIL-E-5400

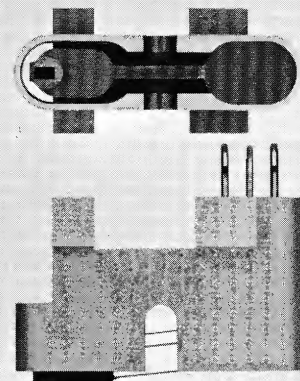
D50 DESIGN DATA

DIAMETER:	3 to 6 inches
LENGTH:	1 to 10 inches
ECCENTRICITY:	Less than .000050 inches
BEARINGS:	Class 9; factory sealed and lubricated
MOTOR:	Custom designed integral motor, induction or synchronous
ROTATION SPEED:	Speed limits are set by rotating member diameter. Maximum speed for D50 Series drums is 24,000 RPM, at a diameter of 3 inches.
TRACKS PER INCH:	40 nominal
TOTAL STORAGE CAPACITY:	Approximate storage capacity ranges between these limits, according to drum size: 3" diameter x 1" length—270,000 bits phase modulation 6" diameter x 9" length—5,400,000 bits phase modulation
MAXIMUM CLOCK RATE:	2 megacycles
MAGNETIC MEDIUM:	Hard nickel-cobalt plate. By becoming an integral part of the rotating member, the plated surface eliminates dusting and flaking problems inherent with iron oxide coatings. Extreme surface hardness greatly reduces susceptibility to catastrophic failure should foreign matter come in contact with the rotating member.

RECORD-PLAY HEADS

The unique aerodynamic head developed by Magne-Head cuts installation and adjustment time to a fraction of that required for conventional, non-contact heads. To add or replace a head, simply insert it at the desired location and lock it in place, *all without stopping the drum*. Head and head slot design make it virtually impossible to damage either the head or the drum coating during the installation process.

Electrical specifications such as head inductance and drive current requirements may be varied to suit the application.

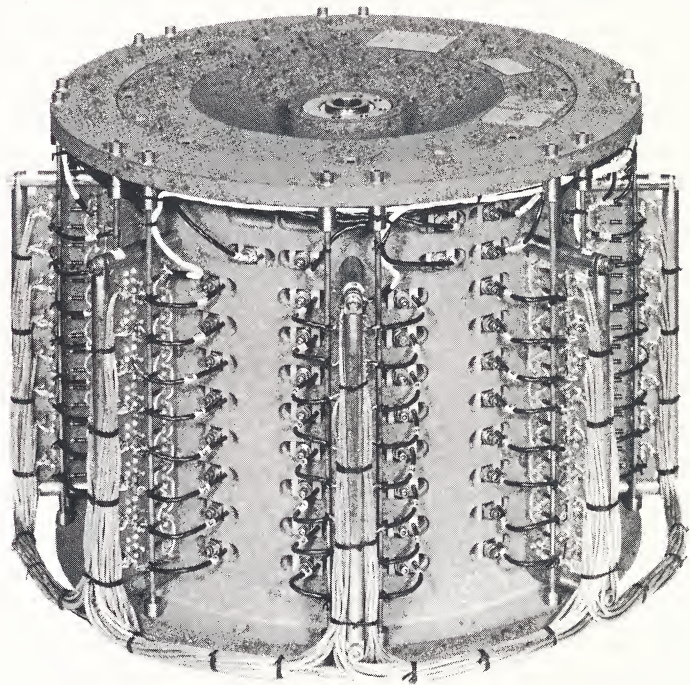




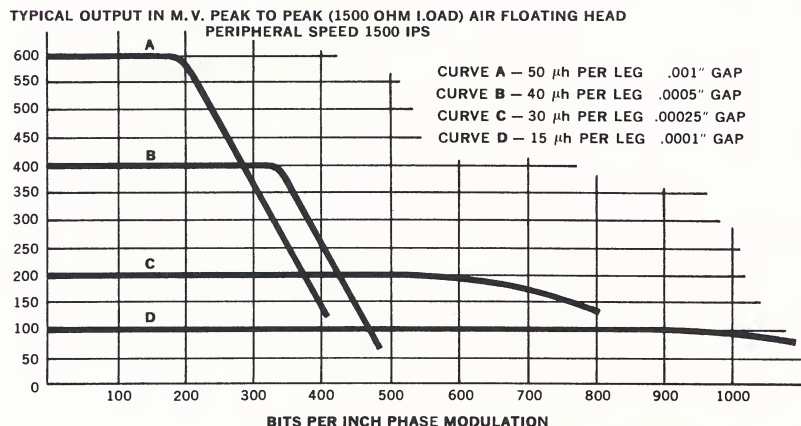
D500 SERIES MAGNETIC MEMORY DRUMS

FEATURES:

- **DEPENDABILITY:** *Plated metal magnetic coating provides the optimum recording surface—hard and durable.*
- **CONVENIENCE:** *Record-play heads may be inserted while the drum is running, with no radial adjustment.*
- **CAPACITY:** *Bit packing densities to 2000 per inch NRZ (1000 per inch phase modulation, R.B., or R.Z.)*
- **SIGNAL TO NOISE RATIO:** *26 db.*
- **VERSATILITY:** *Compliance with applicable military specifications—ground, shipboard, airborne.*



Typical D500 Series drum—9" diameter, 3600 RPM.
Other diameters available in the D500 Series
from 6" to 12".



A PLAYBACK SIGNAL VERSUS PACKING DENSITY GRAPH shows output signal levels over a wide range of frequencies. (Frequency equals peripheral speed in inches per second times packing density in bits per inch phase modulation.) Curves illustrated reflect a peripheral speed of 1500 inches per second. Different speeds produce a roughly linear change in signal level. Outputs shown on the graph are conservatively de-rated. Production experience exceeds these ratings by approximately 25%.

D500 DESIGN DATA

All drums in the medium size D500 Series share basic design features. Magne-Head design criteria provide superior performance: more bits per square inch of recording surface, higher output signal levels, and long term maintenance-free operation. To the systems designer, all of this means fewer interface restrictions when integrating the memory subsystem into the total system.

Magne-Head drums meet a broad range of operational requirements because of flexible design within a framework of dependability. Features and design parameters tailored to meet individual application needs include drum size, speed, and motor type...record-play head inductance, head layout, and wiring harness arrangements.

For military systems, D500 Series drums are designed to meet these typical specifications:

Ground Based: MIL-E-4970A and
MIL-E-4158B
Shipboard: MIL-E-16400E
Airborne: MIL-E-5400

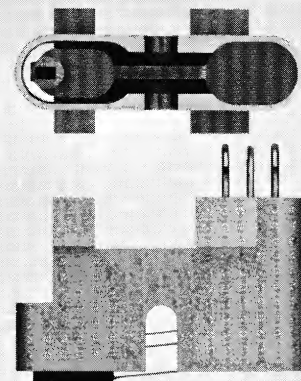
D 5 0 0 D E S I G N D A T A

DIAMETER:	6 to 12 inches
LENGTH:	1 to 18 inches
ECCENTRICITY:	Less than .000050 inches
BEARINGS:	Class 9; factory sealed and lubricated
MOTOR:	Custom designed integral motor, induction or synchronous
ROTATION SPEED:	Speed limits are set by rotating member diameter. Maximum speed for D500 Series drums is 12,000 RPM, at a diameter of 6 inches.
TRACKS PER INCH:	40 nominal
TOTAL STORAGE CAPACITY:	Approximate storage capacity ranges between these limits, according to drum size: 6" diameter x 1" length—570,000 bits phase modulation 12" diameter x 18" length—20,000,000 bits phase modulation
MAXIMUM CLOCK RATE:	2 megacycles
MAGNETIC MEDIUM:	Hard nickel-cobalt plate. By becoming an integral part of the rotating member, the plated surface eliminates dusting and flaking problems inherent with iron oxide coatings. Extreme surface hardness greatly reduces susceptibility to catastrophic failure should foreign matter come in contact with the rotating member.

RECORD-PLAY HEADS

The unique aerodynamic head developed by Magne-Head cuts installation and adjustment time to a fraction of that required for conventional, non-contact heads. To add or replace a head, simply insert it at the desired location and lock it in place, *all without stopping the drum*. Head and head slot design make it virtually impossible to damage either the head or the drum coating during the installation process.

Electrical specifications such as head inductance and drive current requirements may be varied to suit the application.



MAGNETIC MEMORY DRUM DESIGN SHEET

1. GENERAL REQUIREMENTS

MAXIMUM OVERALL HEIGHT ALLOWED _____ (INCHES)
 MAXIMUM OVERALL DIAMETER ALLOWED _____ (INCHES)
 MOUNTING (VERTICAL OR HORIZONTAL) _____
 STARTING TIME ALLOWED _____
 ACCESS TIME REQUIRED _____
 NUMBER AND TYPE CONNECTORS _____
 ENVIRONMENTAL CONDITIONS _____
 STORAGE _____ OPERATE _____
 VIBRATION _____ SHOCK _____
 RECORDING FREQ. _____
 BIT PACKING DENSITY (BPI) _____
 CROSSTALK MAX. REQUIRED _____
 BITS PER TRACK _____

REMARKS — ADDITIONAL REQUIREMENTS, ETC. USE BLANK SHEET IF REQUIRED.

2. TRACK & HEAD REQUIREMENTS

	NO. OF TRACKS REQUIRED	SPARES REQUIRED	NO. OF HEADS PER TRACK		TOTAL HEADS
CLOCK _____					
WORD MARKER _____					
SECTOR MARKER _____					
ORIGIN PULSE _____					
REGISTER MEMORY _____					
MAIN MEMORY _____					
				LENGTH _____	
				TOTAL HEADS	

3. DRIVE INFORMATION

MOTOR TYPE _____
 PWR. SUPPLY _____ VOLTS _____ PHASE _____ CYCLES _____

4. MAGNETIC DRUM HEAD

HEAD TYPE — CONTACT _____ NON CONTACT _____
 INDUCTANCE PER LEG _____ $\pm 10\%$
 RESONANT FREQ. _____ MIN.
 LEADS _____ SHIELD REQUIRED _____
 RECORD CURRENT _____ MAX.
 PLAYBACK SIGNAL _____ MIN.

MAGNE-HEAD DIV. GENERAL INSTRUMENT CORP.

13040 So. Cerise Ave.

HAWTHORNE, CALIF.

772-2351

679-3377

MAGNE-HEAD

DATA BULLETIN



MODEL 71-64 MAGNETIC MEMORY DISC

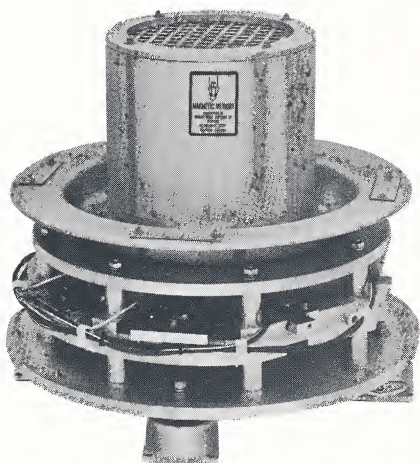
FEATURES:

- **DEPENDABILITY:** *Plated metal magnetic coating provides the optimum recording surface—hard and durable.*
- **CAPACITY:** *Bit packing densities to 1200 per inch NRZ (600 per inch phase modulation, R.B., or R.Z.).*
- **SIGNAL TO NOISE RATIO:** *26 db.*
- **VERSATILITY:** *Variable motor speeds available. Record head output and inductance adjustable to any electronic interface.*



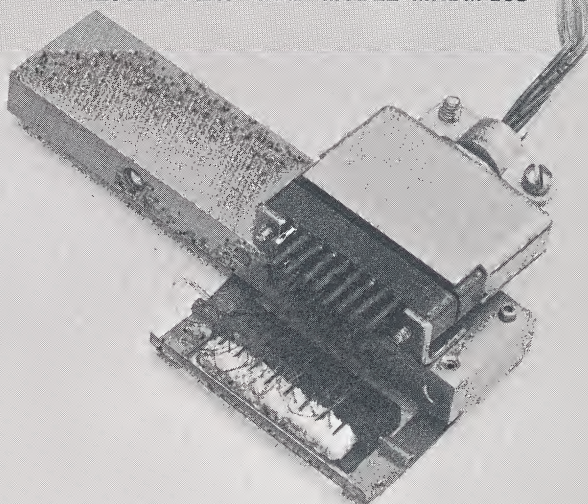
7" Diameter Disc 64 Tracks

SHOWN WITH COVER REMOVED



Storage capacity 600,000 bits.

RECORD PLAY HEAD MODEL MHDM-158



8 Tracks Airfloating .015 inch Track width inductance variable

MAGNE-HEAD

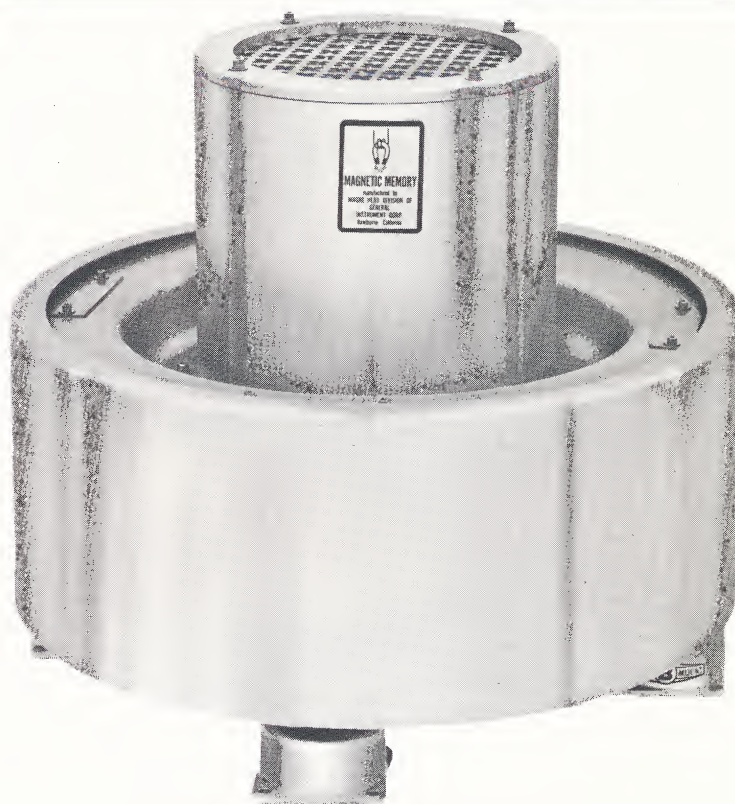
DATA BULLETIN



MODEL 91-128 MAGNETIC MEMORY DISC

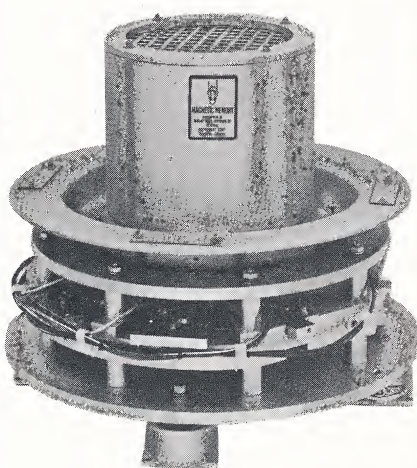
FEATURES:

- **DEPENDABILITY:** *Plated metal magnetic coating provides the optimum recording surface—hard and durable.*
- **CAPACITY:** *Bit packing densities to 1200 per inch NRZ (600 per inch phase modulation, R.B., or R.Z.).*
- **SIGNAL TO NOISE RATIO:** *26 db.*
- **VERSATILITY:** *Variable motor speeds available. Record head output and inductance adjustable to any electronic interface.*



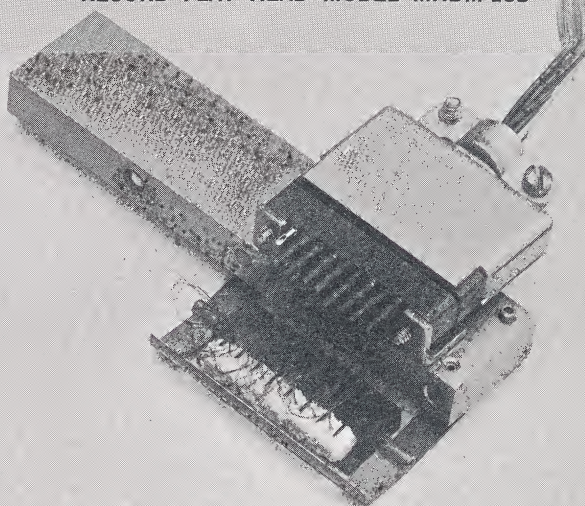
9" Diameter Disc 128 Tracks

SHOWN WITH COVER REMOVED



Storage capacity 1,500,000 bits

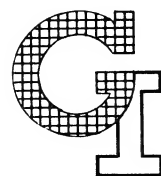
RECORD PLAY HEAD MODEL MHDM-158



8 Tracks Airfloating .015 inch Track width inductance variable

TYPICAL DISC

SPECIFICATIONS



MAGNE-HEAD

A Division of General Instrument Corporation

MODEL #71-64 DISC MEMORY

1.0 Maximum Capacity:	524, 288 Bits
1.1 Number of Discs:	One (7" diameter)
1.2 Recording Diameters:	6.5" Maximum 4.9" Minimum
1.3 Tracks/Radial Inch:	40
1.4 Track Width:	.015"
1.5 Bits/Track:	8129 maximum
1.6 Maximum Packing Density:	532 Bits/Inch
1.7 Number of Tracks	66 as follows:
1.7.1 2 Timing Tracks	
1.7.2 64 General Storage Tracks	
1.7.3 Registers, if required, will reduce the number of general storage tracks by approximately 8 tracks per register	
1.8 Registers:	
1.8.1 Minimum Spacing at Maximum Density:	64 Bits
1.9 Magnetic Heads	(To be specified for a particular application)
1.9.1 Half Coil Inductance	150 Microhenries Maximum 30 Microhenries Minimum
1.9.2 Unbalance between the two half coils of each head will be less than 5%	
1.9.3 Gap Width:	.00025"
1.9.4 Write Current required for full saturation:	(Depends on head selected)
Probable Range:	60 to 150 Milli-amperes
1.9.5 Playback Variation:	2 to 1
1.9.6 Amplitude Modulation: as defined by the formula	10% Maximum
$\% \text{ Mod} = \frac{2 (\text{Max} - \text{Min})}{\text{Max} + \text{Min}} \times 100$	
1.10 Type of Recording:	Phase Modulation

1.11 Noise:	
1.11.1 Random noise from any D.C. erased track will be less than 10% of the minimum playback amplitude	
1.12 Drive System:	Integral Induction Motor (Synchronous on special application)
1.12.1 Speed:	900 RPM, 1800 RPM or 3600 RPM
1.12.2 Power Supply Required:	60 cps 115 V Single Phase 60 cps 220 V Single Phase 60 cps 208 V Three Phase
1.12.3 Starting Device:	Single Phase Drives require start and run capacitors and time delay relay
1.13 Bearings:	
1.13.1 Super Precision Grade 7 Preloaded Ball Bearings are used with a design life of 5 years.	
1.13.2 Bearings are grease lubricated for the lifetime of the bearings	
1.14 Physical Package:	
1.14.1 Axis of Rotation:	Vertical
1.14.2 Overall Size:	11" dia. x 11" high
1.14.3 Total Weight:	45 lbs.
1.14.4 Isolator Mounts:	3 Mounts providing 90% isolation at the rotational speed frequency
1.14.5 Finish: — Structure:	Golden Iridite
1.14.6 Finish: — Dust Cover:	Ivory Enamel
1.15 Environmental Limitations: — (Operating)	
1.15.1 Ambient Temperature:	50°F to 100°F
1.15.2 Thermal Shock:	No restriction within ambient range
1.15.3 Humidity:	0 to 95%
1.15.4 Dust Cover Removal	Restricted to a clean area
1.16 Environmental Limitations: (Non-Operating)	
1.16.1 Ambient Temperature:	0°F to 180°F
1.16.2 Storage Time:	One Year without relubrication of bearings

MODEL #91-64 DISC MEMORY

1.0 Maximum Capacity:	736,000
1.1 Number of Discs:	One (9" diameter)
1.2 Recording Diameters:	8.5" maximum 6.5" minimum
1.3 Tracks/Radial Inch:	32
1.4 Track Width:	.015"
1.5 Bits/Track:	11,500 maximum
1.6 Maximum Packing Density:	533 bits/inch
1.7 Number of tracks:	67 as follows:
1.7.1 64 data tracks	
1.7.2 1 clock track (8192 bits)	
1.7.3 1 synch track	
1.7.4 1 register track	
1.8 Registers:	
1.8.1 1 register track with spacing between read and write head to be approximately 800 bits.	
1.9 Magnetic heads	
1.9.1 Half Coil Inductance	50 microhenries ±10%
1.9.2 Unbalance between the two half coils of each head will be less than 5%	
1.9.3 Gap Width:	.00025"
1.9.4 Write Current required for full saturation:	100 milliamperes maximum
1.9.5 Playback Amplitude:	50 millivolts minimum
1.9.6 Amplitude Modulation:	15% maximum
1.10 Type of Recording:	Phase Modulation
1.11 Noise:	
1.11.1 Random noise from any DC erased track will be less than 10% of minimum playback amplitude	

1.12 Drive System:	Integral Induction Motor
1.12.1 Speed:	3600 RPM (Less 5% slip)
1.12.2 Power:	115V, 60 CPS, single phase
1.12.3 Starting Device:	Single Phase Drives require start and run capacitors
1.13 Bearings:	
1.13.1 Super Precision Grade 7 preloaded ball bearings are used with a design life of 10 years.	
1.13.2 Bearings are grease lubricated for the lifetime of the bearings	
1.14 Physical Package:	
1.14.1 Axis of Rotation:	Vertical
1.14.2 Overall Size:	13" diameter x 11" high
1.14.3 Total Weight:	45 lbs.
1.14.4 Isolator Mounts:	4 Mounts providing 90% isolation at the rotational speed frequency
1.14.5 Finish: — (Structure)	Golden Iridite
1.14.6 Finish: (Dust Cover)	Ivory Enamel
1.15 Environmental Limitations: — (Operating)	
1.15.1 Ambient Temperature:	50°F to 100°F
1.15.2 Thermal Shock:	No restriction within ambient range
1.15.3 Humidity:	0 to 95%
1.15.4 Dust Cover Removal:	No restriction within ambient range
1.16 Environmental Limitations: (Non-Operating)	
1.16.1 Ambient Temperature:	0°F to 180°F
1.16.2 Storage Time:	One year without relubrication of bearings

MODEL #134-512 DISC MEMORY

1.0 Maximum Capacity:	8,192,000 Bits
1.1 Number of Discs:	Four (13" Diameter)
1.2 Recording Diameters:	12.5" Maximum 9.3" Minimum
1.3 Tracks/Radial Inch:	40
1.4 Track Width:	.015"
1.5 Bits/Track:	16,000 Maximum
1.6 Maximum Packing Density	548 Bits/Inch
1.7 Number of Tracks	516 as follows
1.7.1 4 Timing Tracks	
1.7.2 512 General Storage Tracks	
1.7.3 Registers, if required, will reduce the number of general storage tracks by approximately 4 tracks per register	
1.8 Registers:	
1.8.1 Minimum Spacing: at maximum density	64 Bits
1.9 Magnetic Heads	(To be specified for a particular application)
1.9.1 Half Coil Inductance:	100 Microhenries Maximum 15 Microhenries Minimum
1.9.2 Unbalance between the two half coils of each head will be less than 5%	
1.9.3 Gapwidth:	.00025"
1.9.4 Write current required for full saturation:	(Depends on head selected)
Probable Range:	60 to 150 Milli-amperes
1.9.5 Playback Variation:	3 to 1
1.9.6 Amplitude Modulation: as defined by the formula	15% Maximum
$\% \text{ Mod} = \frac{2 (\text{Max} - \text{Min})}{\text{Max} + \text{Min}} \times 100$	
1.10 Type of Recording:	Phase Modulation
1.11 Noise:	
1.11.1 Random noise from any DC erased track will be less than 10% of the minimum playback amplitude	

1.11.2 Crosstalk between any head which is reading a register track or a clock track and any other head which is writing will be less than 10% of the minimum playback amplitude.	
1.12 Drive System:	Integral Induction Motor (Synchronous on Special Application)
1.12.1 Speed:	900 RPM, 1800 RPM or 3600 RPM
1.12.2 Power Supply Required:	60 cps 115 V Single Phase 60 cps 220 V Single Phase 60 cps 208 V Three Phase
1.12.3 Starting Device:	Single Phase Drives require start & run capacitors and time delay relay
1.13 Bearings:	
1.13.1 Super Precision Grade 7 Preloaded Ball Bearings are used with a design life of 10 years.	
1.13.2 Bearings are grease lubricated for the lifetime of the bearings	
1.14 Physical Package:	
1.14.1 Axis of Rotation:	Vertical
1.14.2 Overall Size:	17" dia. x 17" high
1.14.3 Total Weight:	120 lbs.
1.14.4 Isolator Mounts:	4 Mounts providing 90% isolation at the rotational speed frequency
1.14.5 Finish: Structure:	Golden Iridite
1.14.6 Finish: Dust Cover:	Ivory Enamel
1.15 Environmental Limitations: — (Operating)	
1.15.1 Ambient Temperature:	50°F to 100°F
1.15.2 Thermal Shock:	No Restriction within ambient range.
1.15.3 Humidity:	0 to 95%
1.15.4 Dust Cover Removal:	Restricted to a clean area
1.16 Environmental Limitations: (Non-operating)	
1.16.1 Ambient Temperature:	0°F to 180°F
1.16.2 Storage Time:	One Year without relubrication of bearings

	MODEL	No. OF DISCS & DIA.	MAX NUMBER DATA TRACKS	BITS PER TRACK MAX	TOTAL BIT CAPACITY	OUTSIDE DIMENSIONS DIA X HIGH	BIT DENSITY INNER TRACK	PRICE SINGLE UNITS	PRICE 10 TO 30 UNITS	PRICE 50 & UP
SERIES 70	71-64	ONE 7"	64	8192	524,288	11" X 11"	532 Bits/Inch	\$ 3,000	\$ 2,800	\$2,500
	71-128	ONE 7"	128	5200	665,600	11" X 11"	500 Bits/Inch	\$ 4,000	\$ 3,600	\$3,250
	72-256	TWO 7"	256	5200	1,331,200	11" X 14"	500 Bits/Inch	\$ 6,000	\$ 5,200	\$4,750
SERIES 90	91-64	ONE 9"	64	11500	736,000	13" X 11"	533 Bits/Inch	\$ 4,000	\$ 3,800	\$3,500
	91-128	ONE 9"	128	8800	1,126,400	13" X 11"	533 Bits/Inch	\$ 5,000	\$ 4,600	\$4,250
	92-256	TWO 9"	256	8800	2,252,800	13" X 14"	533 Bits/Inch	\$ 7,000	\$ 6,200	\$5,750
SERIES 110	111-64	ONE 11"	64	14895	953,280	15" X 11"	533 Bits/Inch	\$ 5,000	\$ 4,800	\$4,500
	111-128	ONE 11"	128	12200	1,561,600	15" X 11"	533 Bits/Inch	\$ 6,000	\$ 5,600	\$5,250
	112-256	TWO 11"	256	12200	3,123,200	15" X 14"	533 Bits/Inch	\$ 8,000	\$ 7,200	\$6,750
SERIES 130	131-64	ONE 13"	64	18200	1,164,800	17" X 11"	533 Bits/Inch	\$ 6,000	\$ 5,800	\$5,000
	131-128	ONE 13"	128	16000	2,048,000	17" X 11"	548 Bits/Inch	\$ 7,000	\$ 6,600	\$5,750
	132-256	TWO 13"	256	16000	4,096,000	17" X 14"	548 Bits/Inch	\$ 9,000	\$ 8,200	\$7,250
	134-512	FOUR 13"	512	16000	8,192,000	17" X 17"	548 Bits/Inch	\$13,000	\$11,400	\$9,500

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